



# Energy Efficiency and Environmental Stewardship in Mankato

September 14, 2018





# Balanced Approach to Stewardship

## Energy Reduction

- Green Buildings - Build in new energy solutions to new and remodeled facilities
- Sustainable Utility Processes - Retrofit utility processes and equipment
- Energy Savings Performance Contract - Retrofit and add enhancements (impacts water, gas, electric) in all facilities – “Ameresco Energy Project”

## Renewables and Reuse

- Renewable Energy – Community Solar Garden Subscriptions
- Mankato Energy Center Arrangement

## Water Quality & Quantity

- Water and Wastewater Treatment Processes
- MS<sub>4</sub>
- Wetlands and Drainage Enhancement Projects
- Protect River



# Top Ten Energy Users

8.7 kWh used by 5 sites

- Citywide Street Lights
- Intergovernmental Center
- **Wells 14 and 15 @ Land of Memories (1.53 million kWh)**
- **Orness plaza (588,000 kWh)**
- Verizon Wireless Civic Center
- **Wastewater Treatment Plant (1.1 million kWh)**
- **Wastewater Treatment Plant EQ Basins (1.44 million kWh)**
- Water Treatment Plant
- Water Treatment Plant – Lime Processing Building
- **Water Treatment Plant Main Pump Building (4.4 million kWh)**





# Renewable Energy Subscriptions - Community Solar Gardens



# Community Solar Gardens

- Community Solar Gardens (CSG) are small-scale solar energy projects located on land that isn't specific to a customer or subscriber.
- Much like traditional large-scale solar energy projects, these smaller offsite projects provide energy directly into the local electric grid.
- Unlike large-scale solar projects, CSGs offer electric customers virtual subscriptions for the energy and/or the environmental attributes produced by the project.
- Customers may be residential or commercial electric customers.
- These state-run programs vary depending upon where you consume power, what the current rate structure is, how the program has been implemented and what local or state policies are in place.

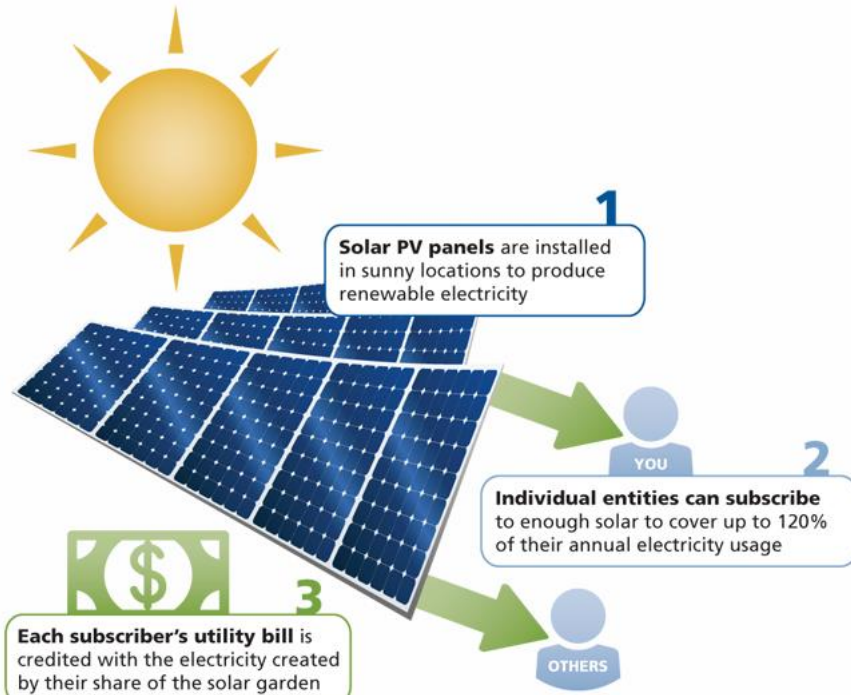


# Community Solar Garden Subscription Process

## How does it work?

Community solar gardens are for people that want to go solar but are unable to do so on their own.

Perhaps you live in an apartment, have a shaded roof at home, or don't have space at your organization. Now you can subscribe to a community solar garden installed near you and get credits on your utility bill.



## How much solar should I get?

The amount of electricity you use helps you decide how much solar to get.

In Xcel Energy territory your solar garden subscription can cover up to 120% of your annual electricity usage. A typical Minnesota home uses 800 kilowatt-hours (kWh) a month. In other utility territories maximum subscription amounts will vary.

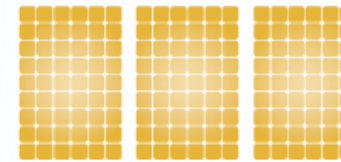
Remember: energy efficiency is always a good place to start!

### Electricity Use



A typical MN home uses 800 kWh each month, or 9,600 kWh each year

### Solar Subscription



4 kW of solar could provide half the electricity used by the typical MN home

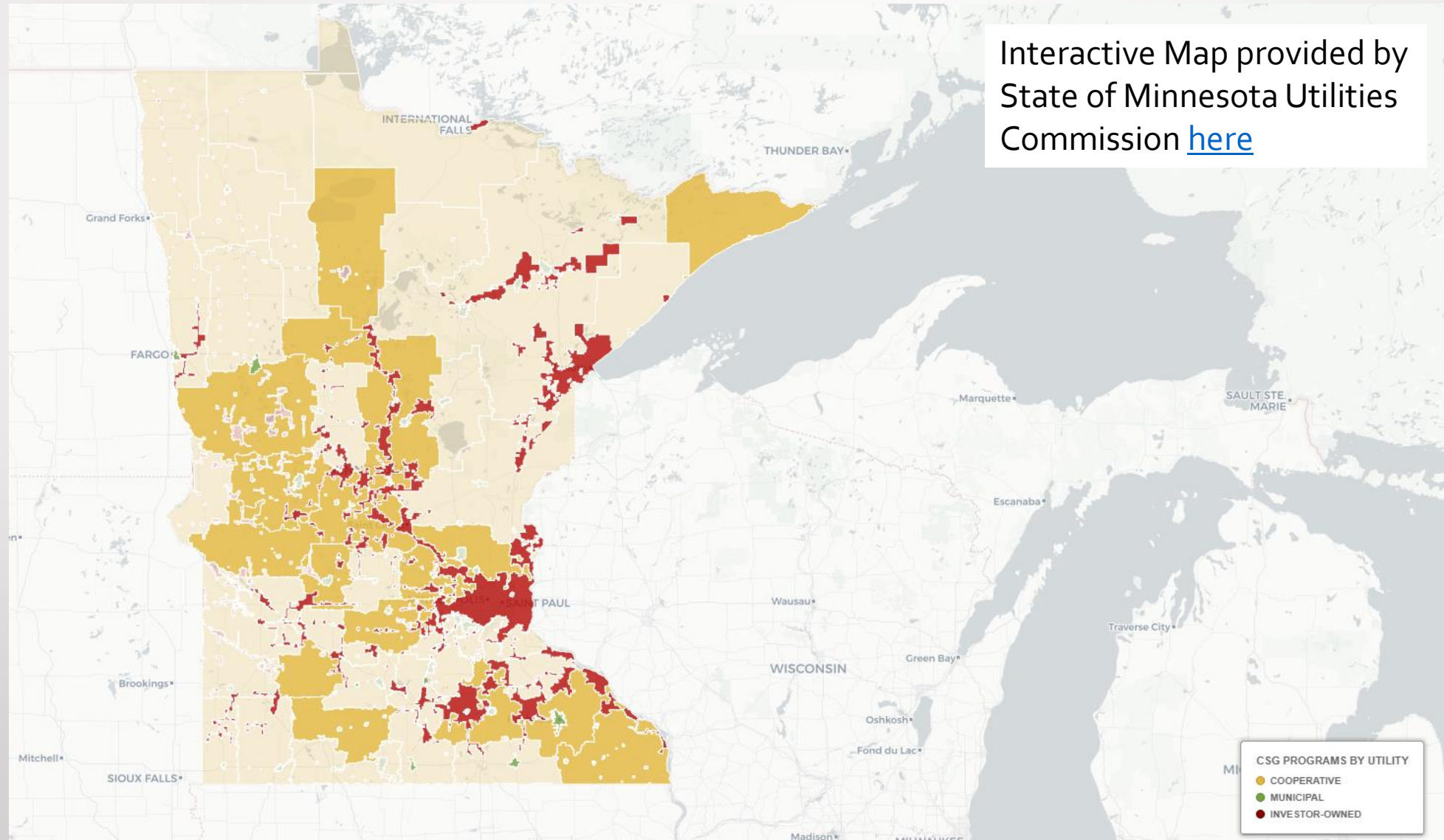
### Utility Bill



Solar power production is shown and credited on the subscriber's utility bill



# Minnesota CGS Locations





# Mankato Energy Savings Estimates CSG Subscriptions

Achieved with subscriptions to eleven separate one megawatt (MW) solar gardens for City and EDA owned facilities

No upfront investment or maintenance by the City

Guaranteed savings of \$.01/kWh for 25 years (\$1,910,683 savings in annual energy cost)

## **City Facilities**

- Offsets 7,320,440 kWh of average annual usage of 8,745,882 kWh annually
- First year savings of \$73,204
- 25 year savings of \$1,724,399 (includes degradation factor at one half of one percent (0.5%) per year

## **EDA Facilities**

- Offsets 695,280 kWh annually (in addition to other offsets)
- First year savings of \$7,908
- 25 years savings of \$186,283 (includes degradation factor at one half of one percent (0.5%) per year
- Sale of 59.51 acre city-owned parcel for solar energy generation – purchase value to EDA \$1.19 million



# Energy consumption by the numbers

## Renewables

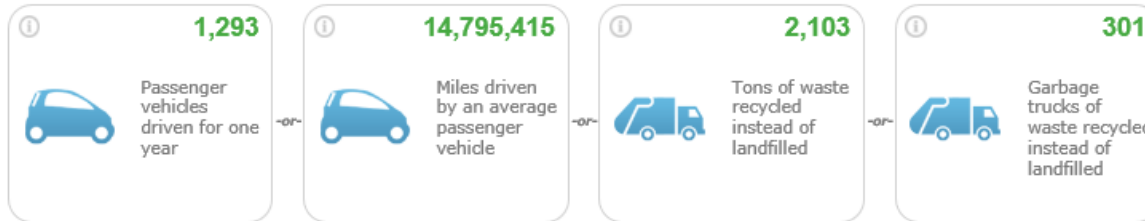
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- ✓ **Five** locations/processes use 40% of Total Energy Consumed
- ✓ Total energy offset by renewables (through solar subscriptions) is approximately 8,111,249 kWh
  - 36.8% Total Energy
  - 91.29% of high five Energy Sites



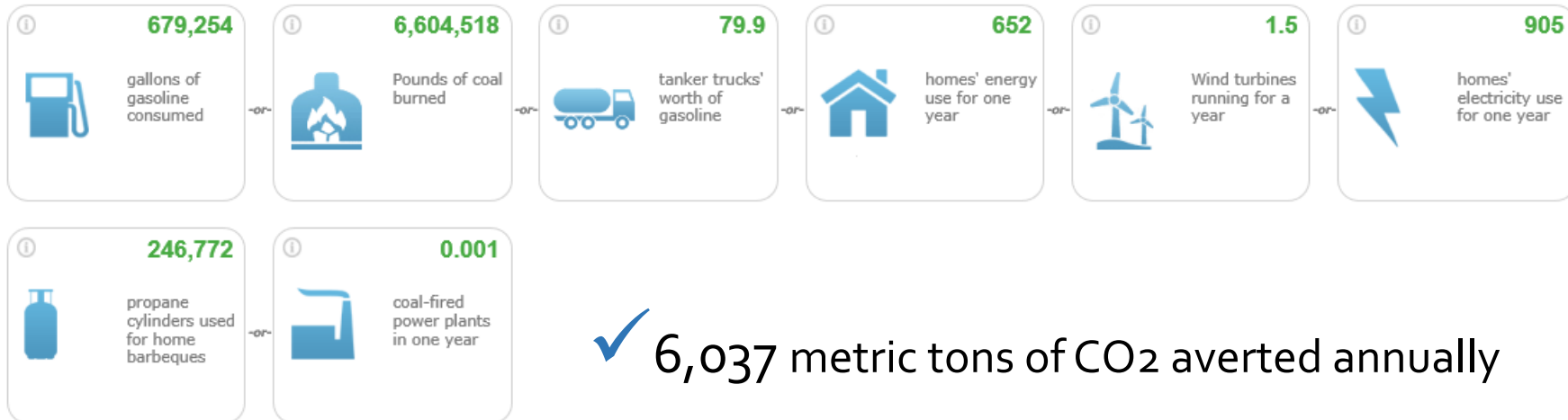
# CSG Subscriptions

## Impact on Greenhouse Gas Emissions

### Greenhouse gas emissions from



### CO<sub>2</sub> emissions from



### Carbon sequestered by



Source: EPA – Greenhouse Gas Equivalencies Calculator ([click here](#))



# New Community Solar Garden at Sakatah Industrial Park

- Geronimo Energy purchased 59.51 acre city-owned parcel for solar energy generation
- Purchase value to EDA \$1.19 million
- 5-megawatt array 1 million square feet of land, six times the size of the existing Mankato solar array south of Highway 14
- Anticipated to produce electricity equivalent to power 500 average Minnesota homes
- Avoid emission of 5,134 metric tons of CO<sub>2</sub> annually







# Sustainable Facilities – New and Renovated



# Orness Plaza

- Orness Plaza, 900 Hope Street, has earned LEED® silver certification by the U.S. Green Building Council.
- Orness Plaza Features that helped earn the award include:
  - A geothermal heating and cooling system was installed for efficient and cost-effective maintenance of building temperatures.
  - Water conserving devices provide efficient use of water resources.
  - Energy Star appliances installed throughout Orness Plaza use less energy, save costs and help protect environment.
  - Design elements improve indoor air quality and may also help improve residents' health; Orness Plaza is part of a nationwide study to determine positive environmental impacts on residents' health.
  - Heavily insulated siding provides energy efficiencies and updates building's appearance.
  - Saves approximately \$27,000 per year in water and fuel expenses.





# Public Safety Center

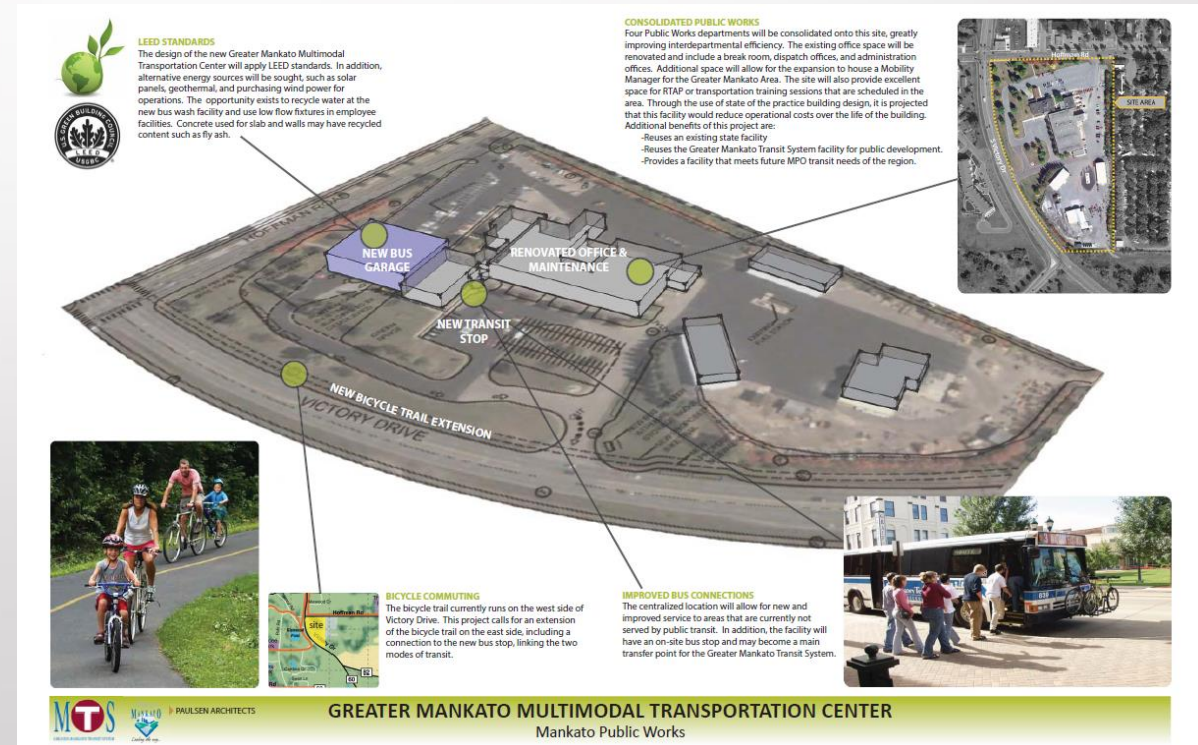
- Mankato's Public Safety Center, 710 South Front Street, has earned Leadership in Energy and Environmental Design (LEED®) Gold certification
- Features that helped earn the award include:
  - Energy use & atmosphere - More than 40 percent efficient compared to a typically designed building, the Public Safety Center uses less energy, saves costs and benefits the environment. Passive solar array integrated on roof of building (approximate \$5,000/yr energy cost savings after year 9 of install).
  - Sustainable Sites - located downtown, the Center is surrounded by services and transportation options. Bike racks and preferred parking for hybrid vehicles and carpools are provided.
  - Materials and resources - The Public Safety Center is a reused building that uses reclaimed and recycled materials for sustainability. The second floor railing is made from jail cell bars, and paints and flooring are environmentally friendly and health safe. Materials were selected locally and regionally.
  - Indoor environmental quality - Air ventilation and filtration and a heating and cooling system provide efficient and cost-effective maintenance of building temperatures.
  - Water efficiency – low-flow fixtures help save water; drought resistant plants, trees and grasses eliminate need for regular supplemental watering.
  - Mankato's Public Safety Center is the most significant investment in a city of Mankato public safety facility within the last 40 years. Building updates have been made to last well into the future.
  - The building brings police and fire staff together for the first time in one facility. The city is better positioned for optimal response times, particularly to West Mankato, the hilltop area and neighborhoods to the west, south and north of the university.





# Transit Center

- Addition to the existing Public Works Facility which was purchased and reused after serving as a MnDOT facility since the 1960's.
- Facility complies with sustainable building guidelines and uses locally sourced and recycled material in a modular precast concrete wall panel system to increase efficiency and reduce waste.
- Xcel Energy's energy design assistance program, the city of Mankato experiences at least a 20 percent savings in energy costs.
- Passive lighting with integrated controls optimizes natural and electric light modules.
- Radiant floor heating is the primary heating source for the maintenance facility.
- High efficiency boilers, energy recovery, and photovoltaic panels are key components of the energy-efficient building systems.
- Low-flow fixtures help save water; drought resistant plants, trees and grasses eliminate need for regular supplemental watering.







# Energy Reduction –

City Owned Solar Arrays &  
Facility Improvements Energy Savings Performance Contract



# City Owned Solar Arrays

## Public Safety Center Solar Array

- 34.2 KW array which contains 175 solar panels with an annual energy production estimate of 42,031 KWh. The initial cost of the installed system was \$273,600 and was largely funded by Xcel Energy's Rewards Rebate and Minnesota Bonus Rebate programs.

The City's investment portion of this array was to pay the installer, \$4,920 each year for the first six years beginning in 2014 with a buyout in year seven (2021) of \$9,840 totaling \$39,360. This array's production currently saves the City approximately \$4,023 per year.

Taking the 14 percent initial investment, which is being spread over seven years, staff expects to see a positive cash flow between years nine and thirteen depending on Xcel Energy rates.

## Mass Transit Maintenance and Storage Building Array

- 11.96 KW array which contains 46 solar panels with an annual energy production estimate of 14,700 KWh. The initial cost of the installed system was \$62,500 and was funded 80:20 state and City matching funds.

The City's cost share of 20 percent (\$12,500) was paid as part of the project and this array's production is estimated to save the City about \$1,470 per year.

Taking the 20 percent initial investment staff expects to see a positive cash flow between years nine and thirteen depending on Xcel Energy rates, which is almost identical to the Public Safety Center scenario.





# Made in Minnesota Solar Incentive Program

- Both the Public Safety and Mass Transit Solar Arrays were developed, installed and subsidized under the “Made in Minnesota Solar Incentive Program”. Public Safety received rebates from Xcel energy, however Mass Transit did not.
- Under the “Made in Minnesota Solar Incentive Program” a solar array could not exceed 40 KW and the allowable rebate was 25 percent of the system installed cost up to a maximum of \$25,000 for commercial systems. The higher rebates the Public Safety Array received through this program are no longer available.
- Xcel Energy currently is not offering any rebates for these types of solar arrays other than actual KWh credits for energy produced by these arrays.
- The “Made in Minnesota Solar Incentive Program” was repealed during the 2017 legislative session and prior program recipients (like Mankato) are still receiving incentive payments.



# Energy consumption by the numbers

## New Facilities

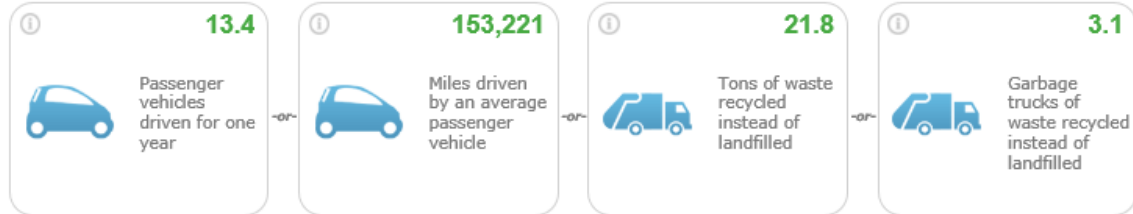
- ✓ Overall city operations consume approximately 22,020,231 kWh electricity annually, valued at \$2,237,904
- ✓ **Five** locations/processes use 40% of Total Energy Consumed
- ✓ Total energy savings from on-facility solar arrays 84,000 kWh annually



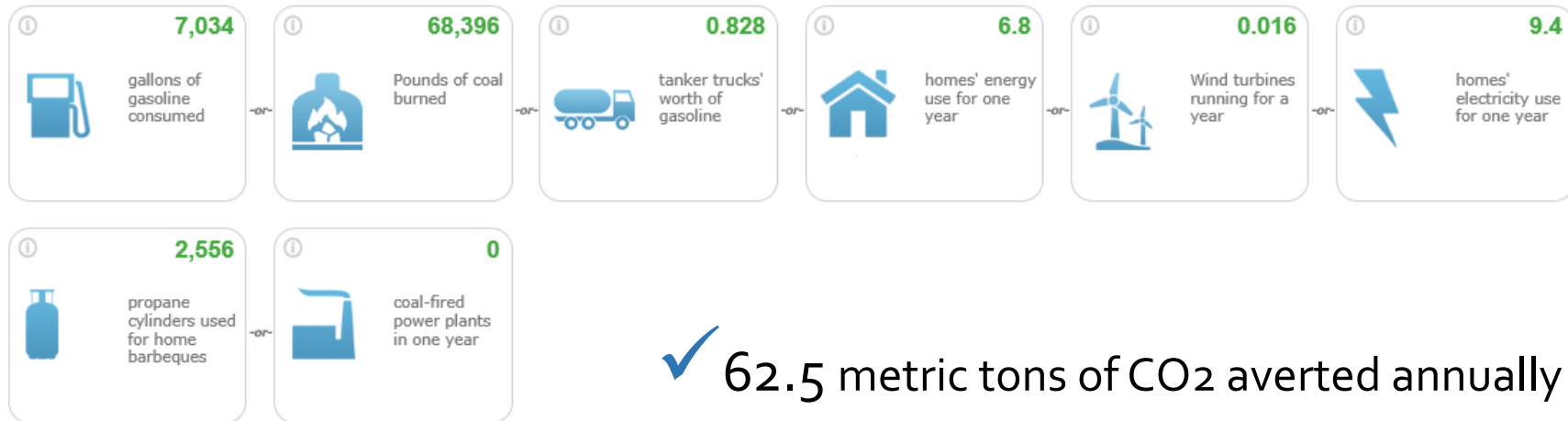
# Solar Arrays

## Impact on Greenhouse Gas Emissions

### Greenhouse gas emissions from



### CO<sub>2</sub> emissions from



✓ 62.5 metric tons of CO<sub>2</sub> averted annually

### Carbon sequestered by



Source: EPA – Greenhouse Gas Equivalencies Calculator ([click here](#))

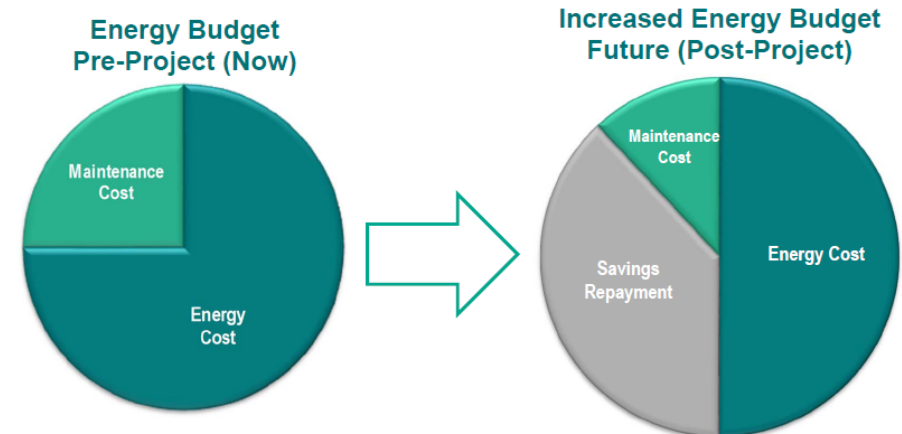


# Energy Savings Performance Contract (ESPC)

- A Self-Funding project which generates cost savings benefit to meet the self-funding requirements per MN Statute § 471.345
- Reduce operating costs and minimize impending capital improvement expenditures (minimize future tax or utility rate increases)
- Investigate other building improvement needs
  - Verizon Civic Center– investigate improvement needs based on energy cost savings strategy / potential savings opportunity
  - Intergovernmental Center – Boiler Replacement
  - Integrate Ameresco Asset Management Analysis/Data

## What does a Guaranteed Energy Saving Project look like?

Ameresco guarantees cost avoidance (utility & operations expenses) will meet or exceed annual payments to cover all project costs, over an agreed upon debt service period, or we will pay the difference.



Enabling Legislation: Minnesota State Statute §471.345 - Energy Efficiency Projects



# Facility Improvements – Project Options (Option A Chosen)

City of Mankato		Project Options		
ECM #	Facility Description	Project A Self-Funding	Project B	Project C
ECM -1	LED Interior Light Upgrades	X	X	X
ECM -2a	Street Lights (Metered)	X	X	X
ECM -2b	Street Lights (Non-metered)		X	X
ECM -3	Water Conservation	X	X	X
ECM -4	Building Envelope	X	X	X
ECM -5	Mechanical Insulation	X	X	X
ECM -6	IGC/Civic Center Controls Recommissioning	X	X	X
ECM -7	WWTP Blower Replacement			X
ECM -8	IGC Boiler Replacement	X	X	X
Customer	Construction Contingency	X	X	X
Cost		\$5.2M	\$5.8M	\$8.2M
Guaranteed Annual Cost Savings		\$284k	\$293k	\$384k
Capital Contribution Funding		\$0	\$200k	\$675k



# Facility Improvements – ESPC

## Project A Self -Funding

Est Cost: \$5.2M

### Benefits

- Energy cost savings represents **14% Plus** of City's annual utility spend!
- **NO CAPITAL** (\$0) contribution required – Self-Funding from Cost Savings
- Metered Street Lights Included
- Repurposes utility budget dollars to fund improvements
- Upgrade equipment/systems which are inefficient
- Reduces Future O&M costs



### Project A - Economics

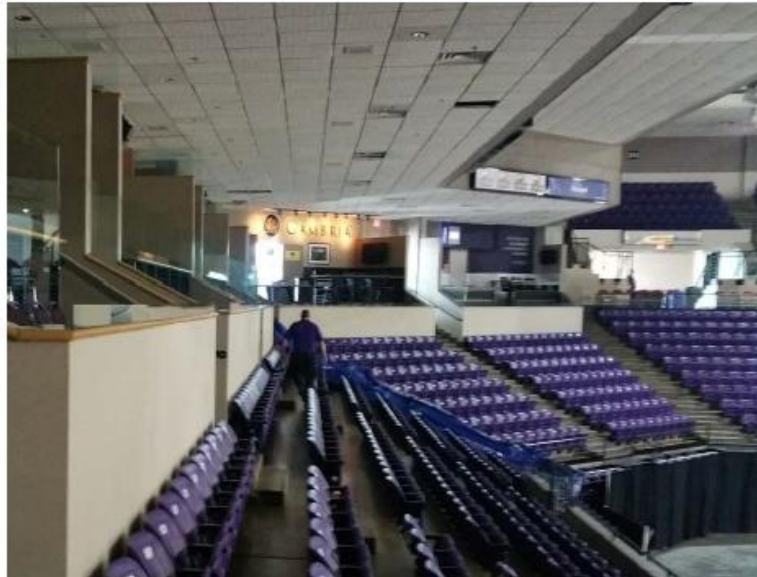
Project Cost	\$5.2M
Guaranteed Annual Cost Savings	\$284 K
Interim Cost Savings (during implementation)	\$50k
Rebates Estimate (one time only)	\$224k
Capital Contribution Required	\$0
Excess Savings (20 Yrs) Positive Cash Flow	\$805k
Simple Payback (years)	18.4



# ECM – 1 Interior LED Lighting Upgrades

## Scope of Work

- LED lighting upgrades from fluorescent/incandescent lighting
- Interior: combination of new LED fixtures and LED retrofit upgrades
- Exterior: New LED fixtures
- New Civic Center Arena lighting



## Facilities included in Scope of Work

- ◆ Civic Center
- ◆ Intergovernmental Center
- ◆ Parking Ramps
- ◆ Public Works
- ◆ WWTP
- ◆ Water Plant
- ◆ Airport Terminal
- ◆ Airport Hangers
- ◆ PSC & Fire Station 1
- ◆ Fire Station 3
- ◆ Tech Plus Building
- ◆ DNR Buildings
- ◆ Parks & Support Buildings
- ◆ Tourtellotte Pool

## Investigated: Not Included

- ◆ Fire Station 2 (recent construction)



# ECM – 1 Interior LED Lighting Upgrade

## Benefits

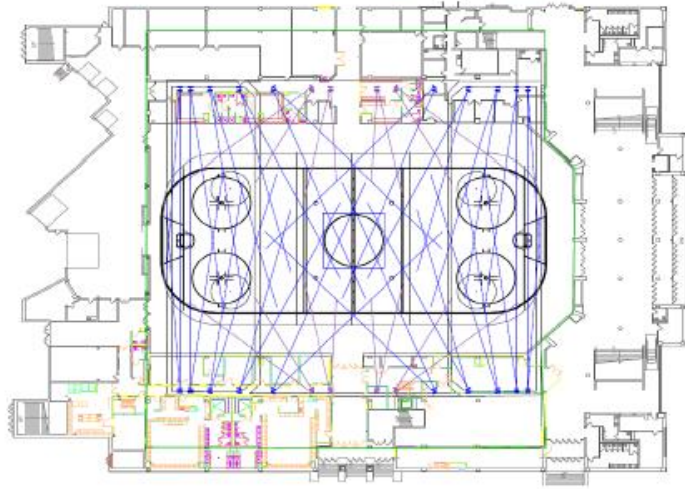
- Energy cost saving
- Maintenance cost savings, service life expectancy
- Improved light distribution/uniformity
- Standardization of lighting type
- Security – improves parking ramp lighting and security camera clarity
- Ramp lighting to be zone-controlled with occupancy sensors



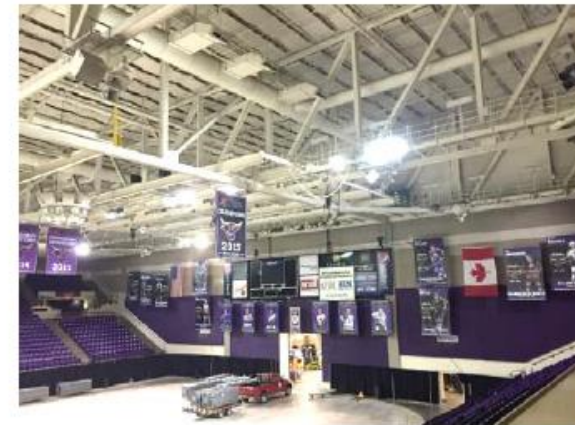


# ECM – 1 Interior LED Lighting Upgrades

## Verizon Arena Lighting



- Ephesus lighting fixture upgrade
- Installing 56 new LED fixtures replacing 252 existing HID fixtures
- Broadcast quality lighting and control
- Eliminates ballast noise – *BUZZ!!!*
- Reduces arena/building heating load (may also improve ice quality)
- **Used Currently** in the US Bank Stadium





# ECM – 2a LED Street Light Upgrade (Metered Only)



LED Street Light  
Conversions



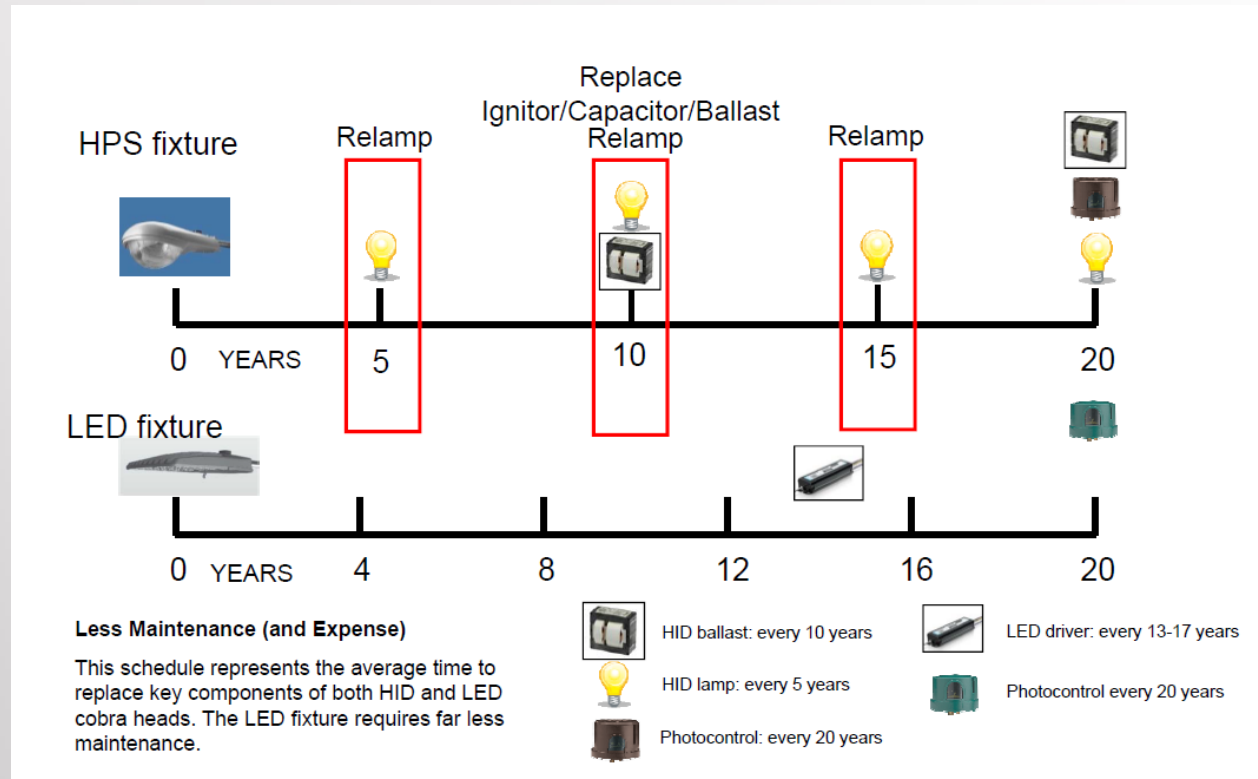
## Scope of Work - Difference

Fixture Description	No.	Project A	Projects B & C
Metered Non - Decorative *	402	X	X
Metered Decorative	539	X	X
Subtotal	941		
Non-Metered Non - Decorative	286		X
Non-Metered Decorative	17		X
Subtotal	303		
Total Fixtures	1244		

\*Includes 2 existing LED fixture with ROAM control added



# ECM – 2a LED Street Light Upgrade Benefits



- Energy cost saving
- Maintenance cost savings, service life expectancy
- Improved light distribution/uniformity
- Standardization of lighting type
- Security – improves exterior lighting and security camera clarity
- ROAM system expansion – adjust schedules for light output levels (dimming)



# ECM – 3 Water Conservation

## Scope

### **City and Public Buildings**

- Retrofit sink faucets with tamperproof low flow aerators
- Showerheads: New 1.5 gpm heads/wands in public/city staff locations
  - Non-aerated spray; less temperature loss
  - Tamperproof flow compensator
  - Three spray settings, 9 jet spray
- Replace or retrofit urinals and toilets

## Benefits

- Costs savings through reduced water consumption and waste water treatment needs
- Energy Savings from Domestic Hot Water Use Reduction



Shower  
head or  
Shower  
wand





# ECM – 4 Building Envelope

## Scope

- Seal and weather-strip all city buildings except DNR and Parks
- Install polyurethane sealant in all wall cracks and concrete mortar cracks,
- Install door sweeps
- Seal joints
- Silicone sealant weather-stripping, capping the exterior edges of EPDM glazing gaskets, sealing joints between non-porous surfaces (i.e. metal and glass)

## Benefits

- Reduces energy; reduces building heating and cooling Loads
- Preserves building structures – reduces penetrating moisture damage
- Improves occupant comfort by minimizing uncontrolled air infiltration
- Improves building aesthetics





# ECM – 5 Mechanical Insulation

## Scope

### **Insulate Piping and Equipment**

- Piping, Valves, Pumps, and Flanges at Verizon Civic Center and Waste Water Treatment Plant

## Benefits

- Reduce WWTP Process Heat Loss
- Personnel Protection and Noise Control
- Condensation and Freeze Protection
- Reduce Corrosion Potential
- Reduce ongoing insulation maintenance expense



Un-insulated pipe



Un-insulated centrifugal pumps

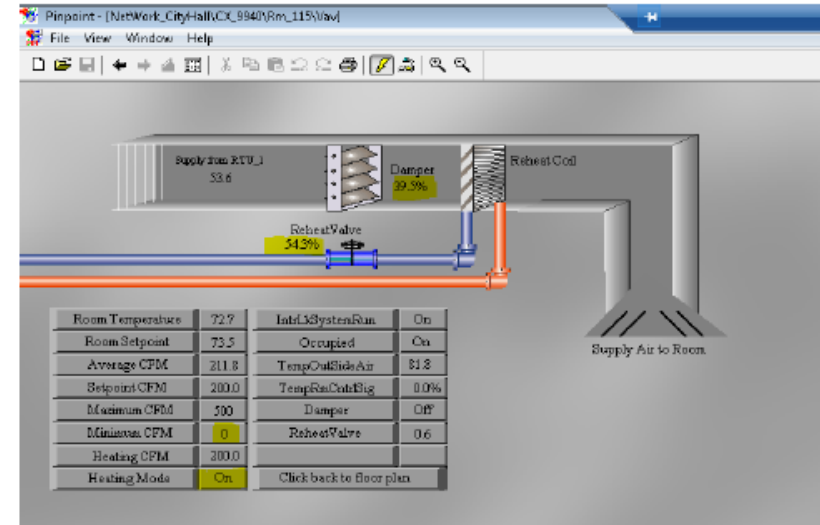


# ECM – 6 Recommission Controls

## IGC & Verizon Civic Center

### Scope

- Schedule and set-point changes in the existing control system
- Optimize VAV box control sequence to reduce simultaneous heating/cooling
- Implement efficient programming: RTUs, AHUs, and Verizon Civic Center chiller



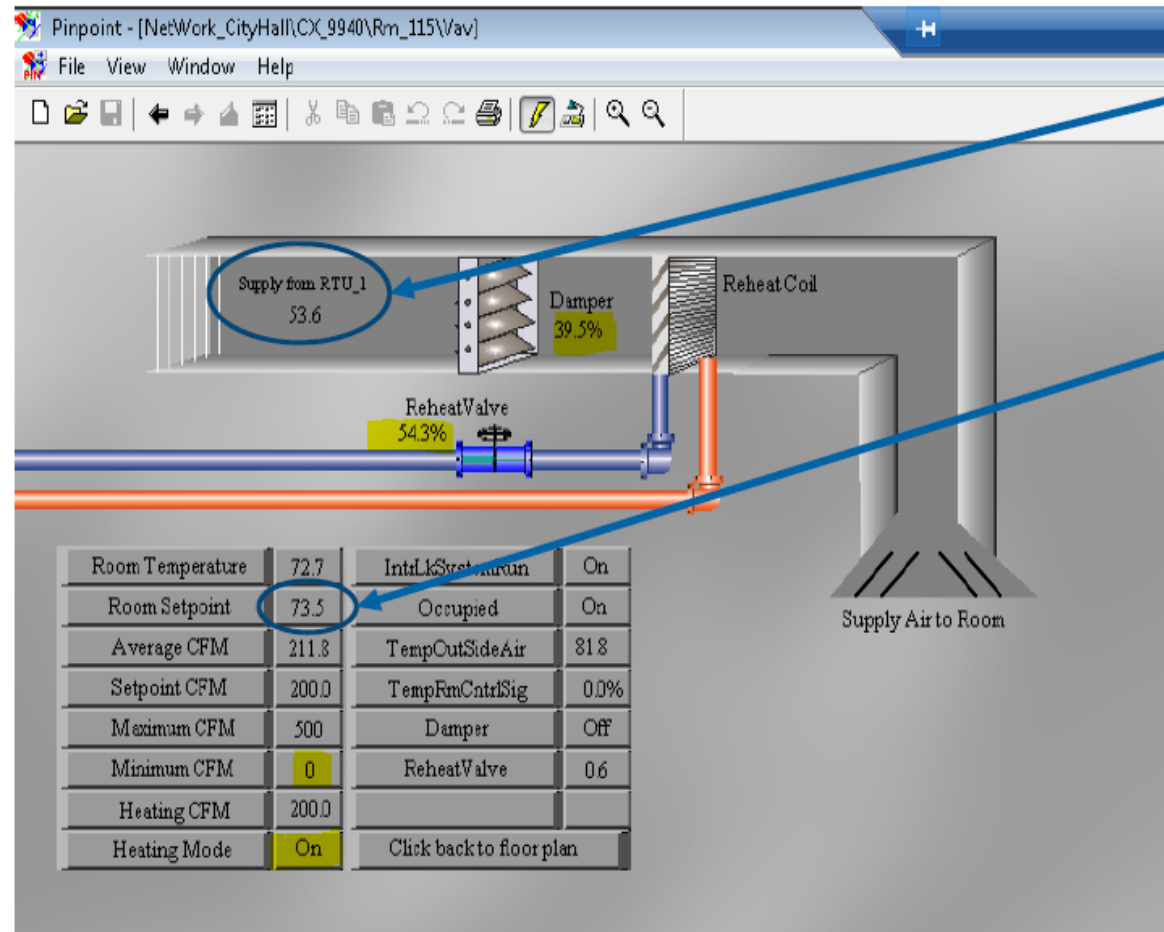
### Benefits

- Occupied and un-occupied schedule defined
- Energy cost savings
- Verizon Civic Center chiller runtime reduction
- IGC reheat energy reduction



# ECM – 6 Recommission Controls

## IGC Example



- RTU-1 currently supplying cold air due to other VAV zone cooling requests
- Zone set-point is 73.5°F with high reheat needs
- Re-commissioning will provide operational changes for improved automation control



# ECM – 7 Boiler Replacement: IGC

## Scope

### ***Replace Existing Boilers with New High Efficiency Condensing Boilers***

- New controller provides adjustable hot water reset
- Install boiler isolation valve and piping interconnection
- Reuse existing hot water pumps
- Correct combustion air intake and combustion exhaust problem
- Automated boiler isolation valves

## Benefits

- Energy costs savings through optimized temperature setback control
- Improve boiler modulation to match building heating demand
- New isolation valves prevent hot water backflow through the heat exchanger when boiler is off, saving pumping energy and heat loss
- New combustion gas venting solves negative pressure problems in mechanical room



*Existing IGC boilers*



*Proposed boiler upgrade style*



# Energy consumption by the numbers

## Facility Retrofits

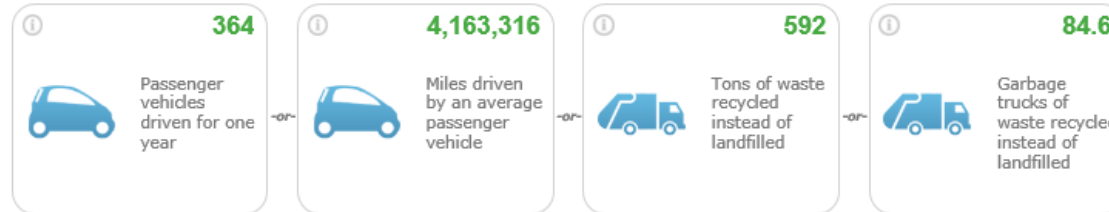
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- ✓ **Five** locations/processes use 40% of Total Energy Consumed
  - ✓ Total energy reduction from facility retrofits when complete - approximately 2,282,443 kWh annually
  - ✓ 37,000 therms of natural gas annually
  - ✓ 254,000 gallons of water annually



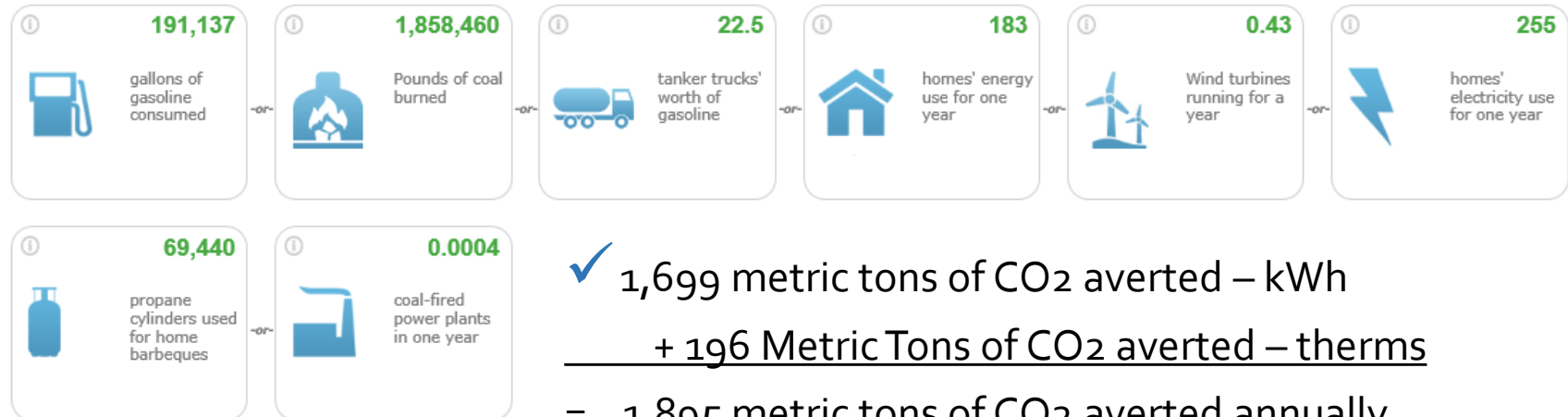
# SEPC Facility Retrofits

## Impact on Greenhouse Gas Emissions

### Greenhouse gas emissions from



### CO<sub>2</sub> emissions from



### Carbon sequestered by



$$\begin{aligned}
 & \checkmark 1,699 \text{ metric tons of CO}_2 \text{ averted} - \text{kWh} \\
 & \quad + 196 \text{ Metric Tons of CO}_2 \text{ averted} - \text{therms} \\
 & = 1,895 \text{ metric tons of CO}_2 \text{ averted annually}
 \end{aligned}$$

Source: EPA – Greenhouse Gas Equivalencies Calculator ([click here](#))



# Energy consumption (kWh) by the numbers

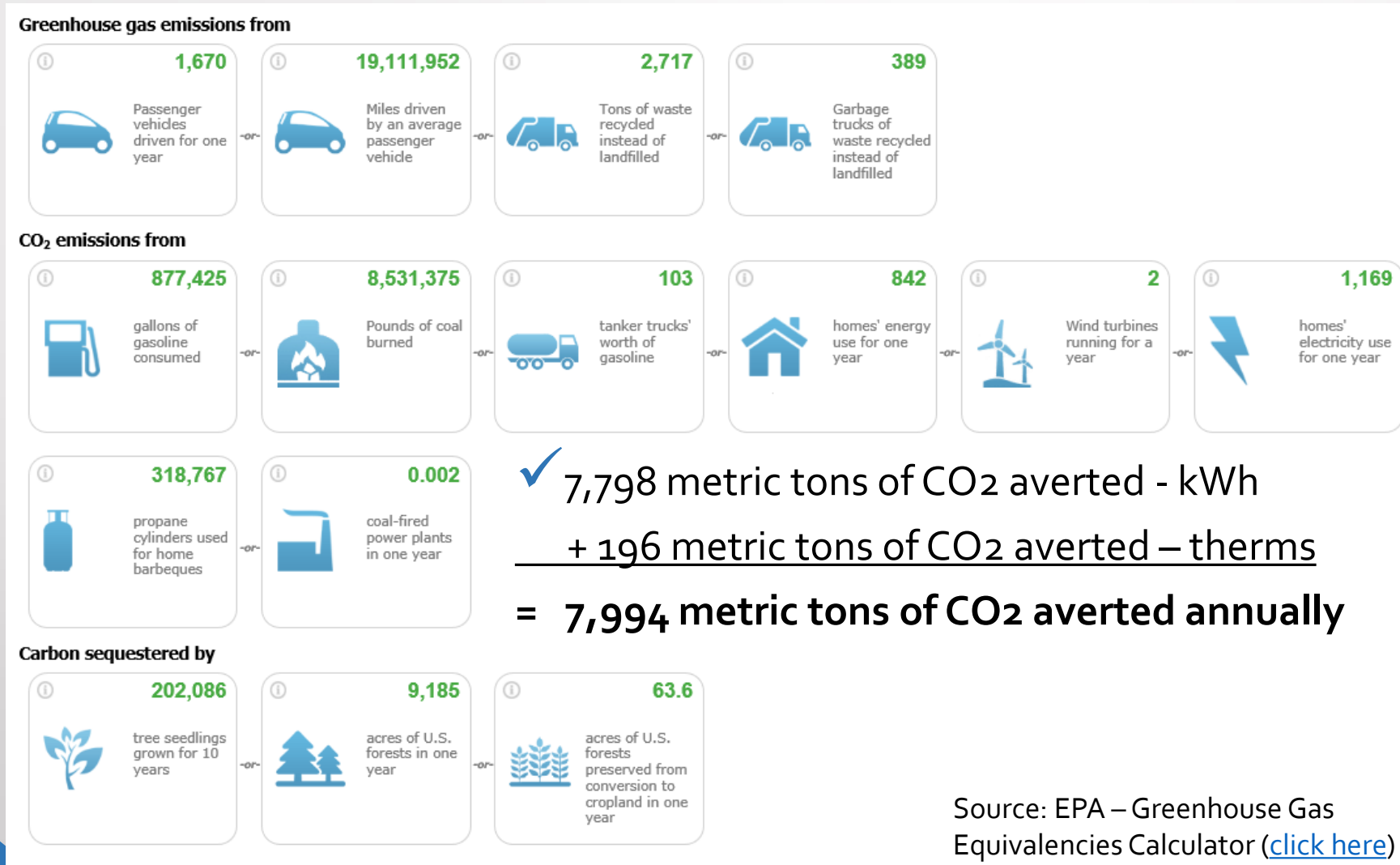
## All Energy Improvements

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  - 36.8% Total Energy
  - 91.29% of high five Energy Sites
- ✓ Total electric reduction from facility retrofits when complete - approximately 2,282,443 kWh annually
- ✓ Total electric savings from on-facility solar arrays - 84,000 kWh annually
- ✓ Total Energy provided with credits and conservation – 10,477,692 kWh annually
- ✓ **48% of total energy (electric) provided by renewables once all retrofits and all solar subscriptions on line**



# All Energy Conservation

## Impact on Greenhouse Gas Emissions







# Water Quality

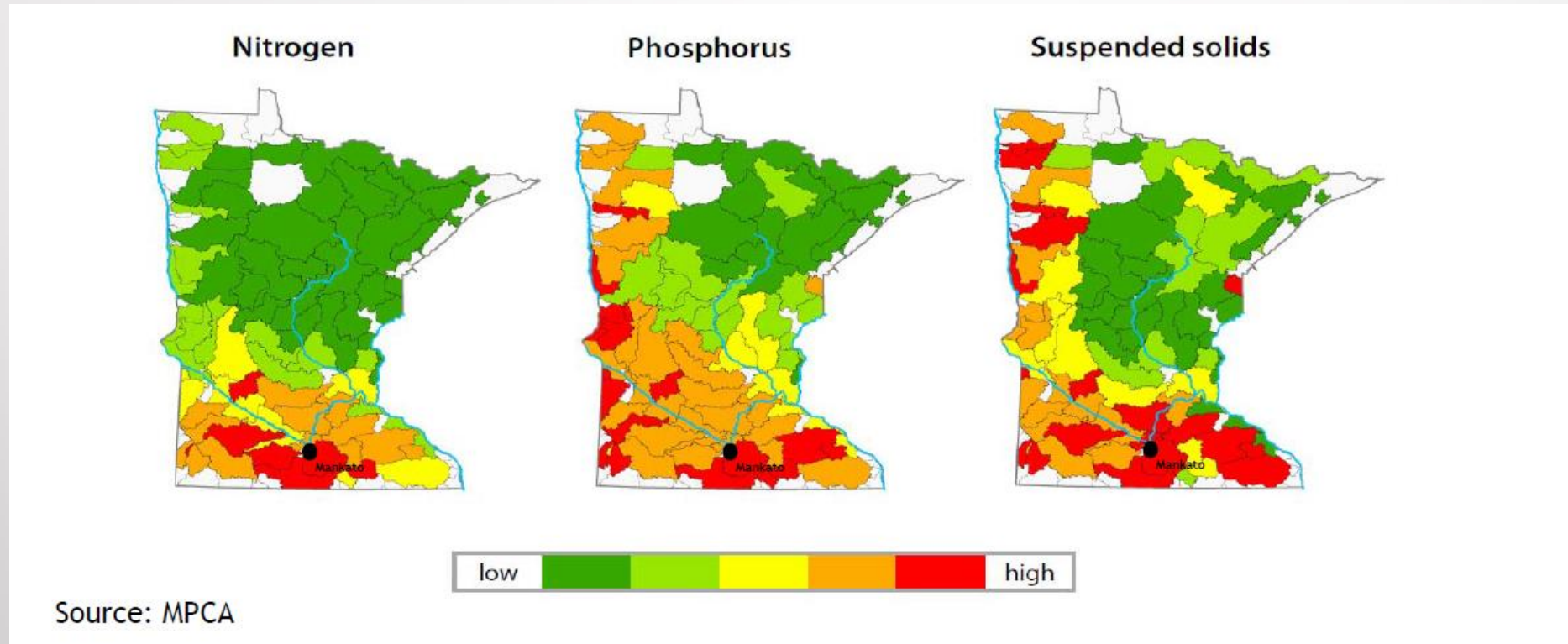
Domestic Water Treatment, Wastewater Treatment and  
Surface Water Management



# Minnesota River Basin Problem

Watershed Pollutant Load Monitoring Network (WPLM)

Greater Mankato located in epicenter of Minnesota water pollutant problem





# Domestic Water Treatment Efforts

## Water Treatment Plant

- \$145 Million asset providing 11.25 million gallons per day (MGD) potable water
- \$50 million investment in water treatment efforts
- Diversity of water sources: 75% shallow collector wells; 25% deep aquifers
- Upgraded water treatment
- State of the art filters
- Treatment to remove nitrates will require additional \$20-30 Million investment
- Established water conservation program with water loss prevention, irrigation restrictions, rate structure redesign
- Reduced dependence on deep wells (Mount Simon aquifer) by about 50%



# Water Treatment Facilities



Water Treatment Plant



Shallow collector well – 75% of city's water supply comes from 2 collector wells influenced by Minnesota and Blue Earth Rivers



# Domestic Water Treatment Efforts

- To improve water quality, city invested \$40 million between 2008 and 2013 to install state of the art membrane filters and lime softening.
- Spent lime from softening process at treatment plant is taken by an ag vendor and applied to farm fields for pH adjustment after crops harvested.
- To reduce volume of treated water wasted to backwash membrane filters, city completed a water reuse project within treatment process saving 180 million gallons annually in treated water that would otherwise be sent to wastewater treatment plant.
- Increasing nitrate levels in Blue Earth River affects city's shallow collector wells. In 2015, city installed new horizontal collector well to draw water from Minnesota River Water table to reduce use of existing deep wells in Mt. Simon Aquifer.



# Wastewater Treatment Facilities



- Water Resource Recovery Facility



- Wastewater Reclamation Facility



# Wastewater Treatment Efforts

- \$150 million plant that services 11.25 million gallons of flow per day from population of 65,000 covering six communities.

## Future investment for Wastewater Treatment

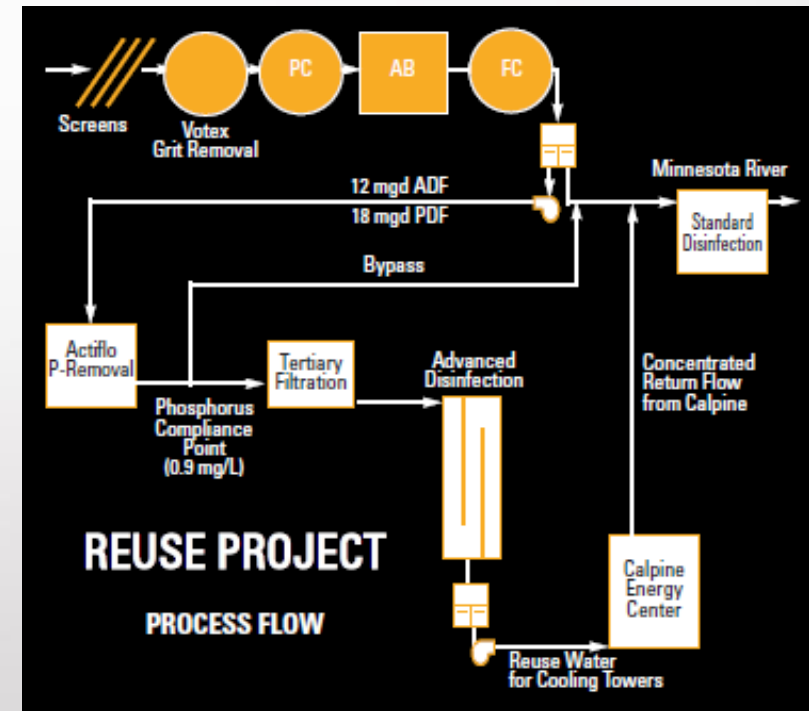
- \$39 million – maintain wastewater capacity
- \$8 million – address permit standards
- \$14 million – address growth needs

\$2 million (partnering with Minnesota Energy Center) to upgrade WRRF and provide additional pumping capacity for MEC cooling process and further reduce need for potable or ground water for process.



# Wastewater & Mankato Energy Center

- Uses recycled wastewater (rather than ground water resources) by providing treated wastewater (not to drinkable standard) to MEC as cooling water for 340-megawatt combined-cycle power plant.
- Saves nearly 700 million gallons of water annually
- Partnership and resulting pretreatment process also produce extremely low phosphorous discharge into Minnesota River – well below regulatory standards





# Surface Water Management Program

## Surface Water Management Policy/Customized In-House Development

- Public and Private activities along natural waterways
  - Vegetation and erosion management

## Grading and Drainage Manual/Customized In-House Development

- Design requirements for development
  - Increased nutrient & pollution removal and rate control

## Model MS<sub>4</sub> Program/Customize In-House Development

- Strategic partnership with neighboring MS<sub>4</sub> permittees
- Staff activities for permit compliance
- Street sweeping & leaf pick up, infrastructure & Flood Control inspection and proactive maintenance
- Illicit discharge elimination

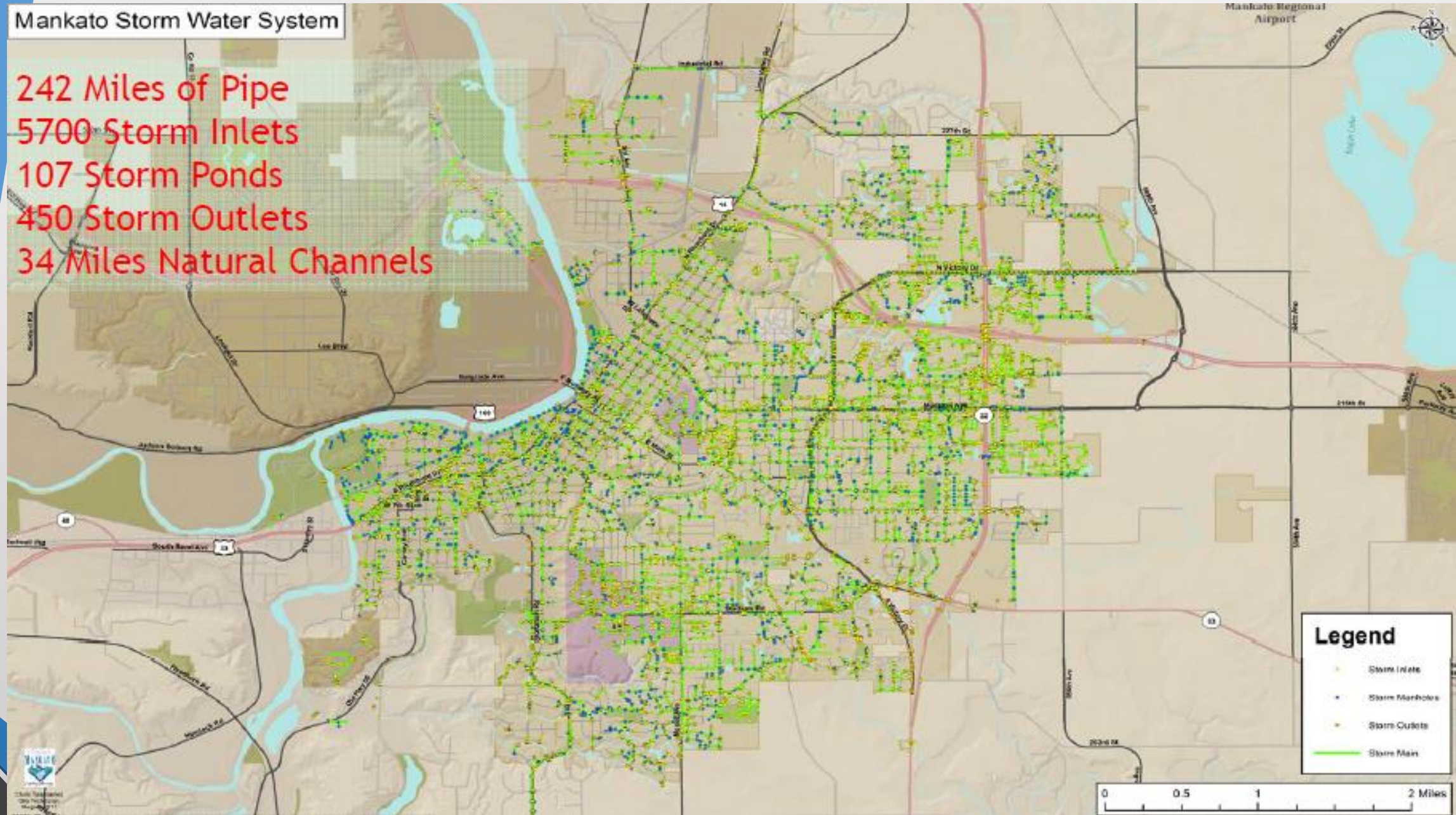
## Municipal Separate Storm Sewer System (MS<sub>4</sub> Permit)

- In compliance with the provisions of the federal Clean Water Act (CWA)
- This permit establishes conditions for discharging **stormwater** and specific other related discharges to **waters of the state**.
- This is accomplished by protecting the City of Mankato Storm drain system from avoidable pollution. We achieve this using a combination of education, best management practices and enforcement.



## Mankato Storm Water System

242 Miles of Pipe  
5700 Storm Inlets  
107 Storm Ponds  
450 Storm Outlets  
34 Miles Natural Channels



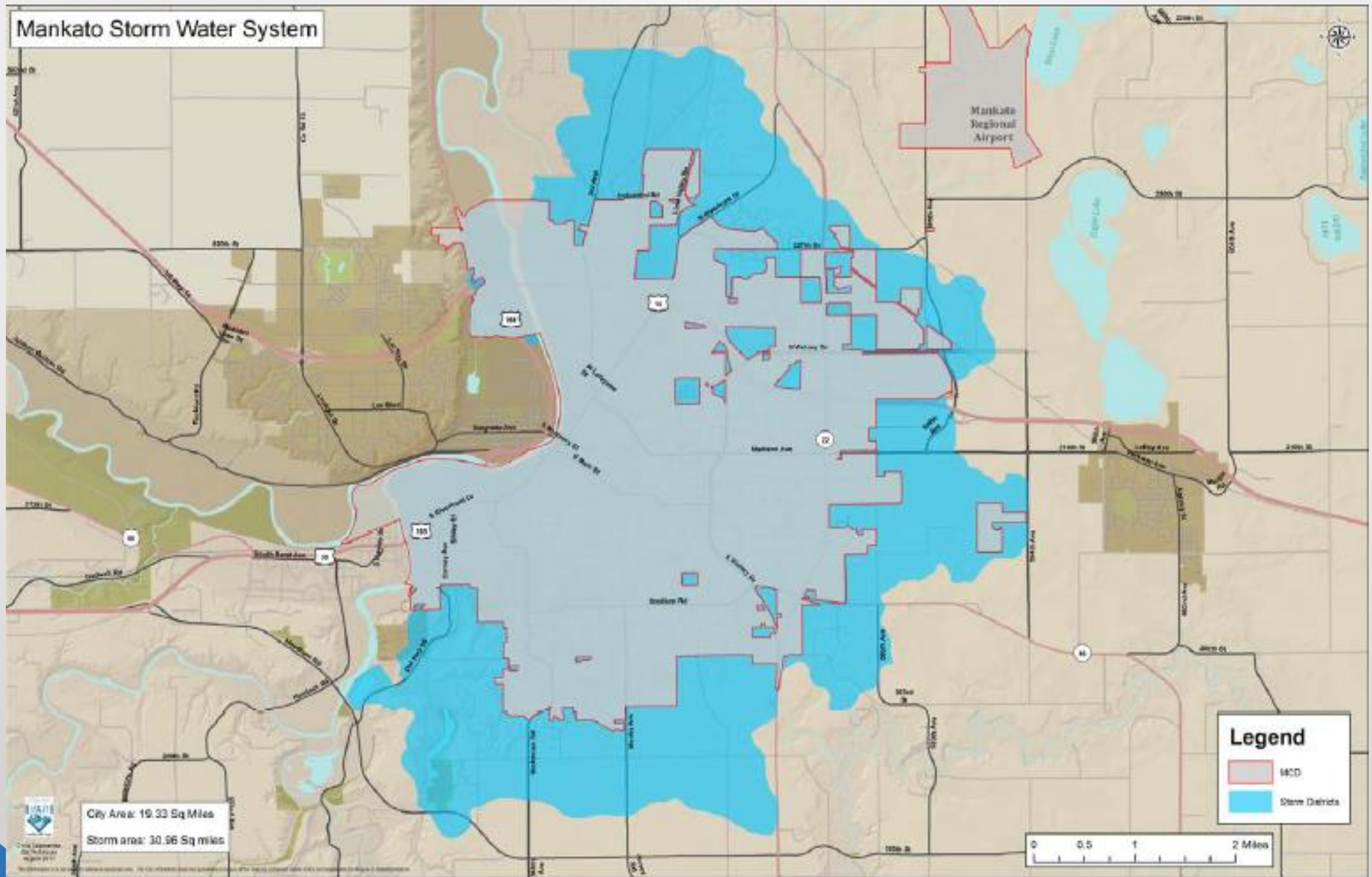


# Surface Water/Storm Water Challenges

- The reductions in Mankato's pollution load are the direct result of the City and it's citizens taking this issue very seriously.
- The City has invested millions of dollars to improve the quality of OUR urban stormwater discharges.
- We cannot control the **velocity, quantity, and quality** of outside water coming into the Mankato system.
- The stormwater coming to Mankato from outside our jurisdiction is predominately unchecked and uncontrolled rural runoff.
- Many times wetland mitigation & improvements for roads and non-farm development increase the rate and quantity of stormwater discharged through city's stormwater system.
- When more impervious area is added, ditches are widened, or tile is installed, this increases the demand on the city's infrastructure and storm water system.
- When there's no control we unaware of the increases and cannot be prepared for storm events as was the case in the 2014 flood.



# Mankato Storm Water System





# Next Steps

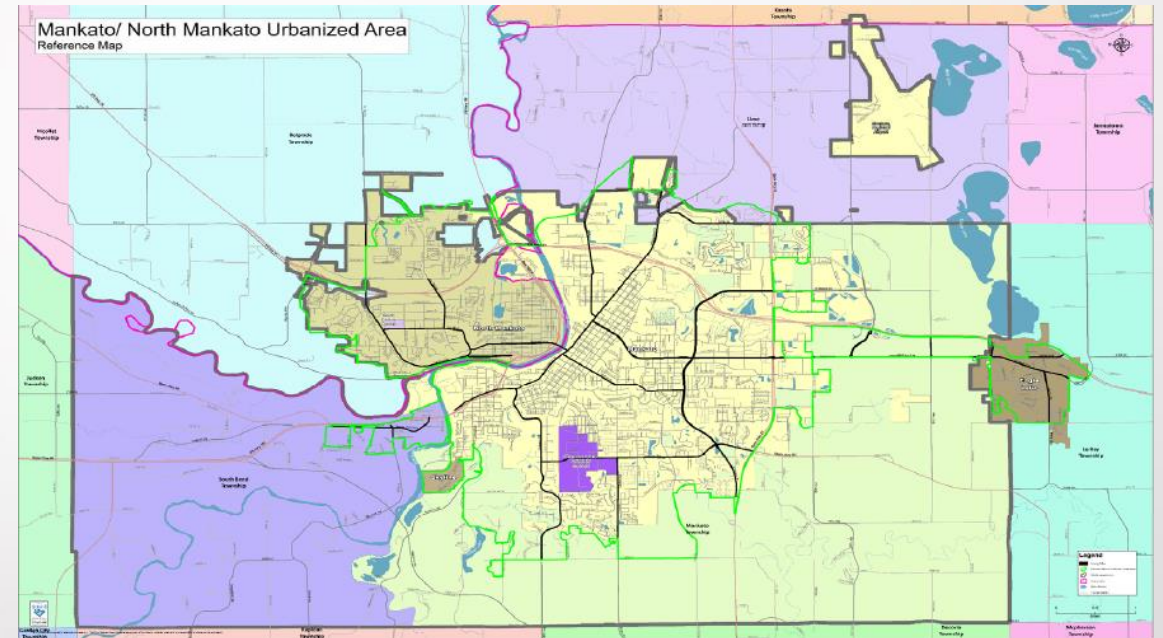
## Strategic Water Quality Improvements

Formed an MS<sub>4</sub> partnership with the new MS<sub>4</sub>'s in Mankato urbanized area.

- Allows surrounding communities to adopt City of Mankato program and utilize Mankato staff and avoid administrative and staffing expenses.
- First formal partnership of it's kind in Minnesota.
- Partnership will also help simplify the cross jurisdictional issues for projects

Developed a program to combine the treatment of non-point rural run-off within the urban storm water system.

- Proposed non-point treatment best practices funded through 50% state bonding/50% local option sales tax.
- Proposal will achieve an additional 18% to 25% reduction in phosphorus and a 33% reduction in suspended solids from rural run-off at the point of entering the urban storm water system and the Minnesota River basin.



*MS<sub>4</sub> Partners (since 2016): City of Mankato • Blue Earth County • Nicollet County  
• Mankato Township • South Bend Township • Minnesota State University • Minnesota  
Dept. of Transportation*



# Water Quality Issues are Complex

- Mankato's stormwater system is overloaded, as evidenced by flooding in 2014 and 2016.
- Unchecked stormwater from rural areas is overwhelming the system.
- Drinking water infrastructure is threatened by rapid and extensive river erosion.
- Sedimentation and nutrient levels travel through the stormwater system as runoff into the river.
- Current River Eutrophication Standards (RES) only measure/regulate nutrient levels at the point of discharge for treatment plants.
- Utility operations and treatment are our largest energy users and require continuous update, change, and processing changes that impact energy consumption.
- Protecting the river with water quality initiatives in addition to treatment processes (and working with the State to address holistic methods to address pollution) address flooding, erosion, protects infrastructure, and minimizes likelihood of energy-intensive utility process changes.

## Leading the Way

*Mankato is leading efforts to reduce pollution through its financial support & partnerships.*

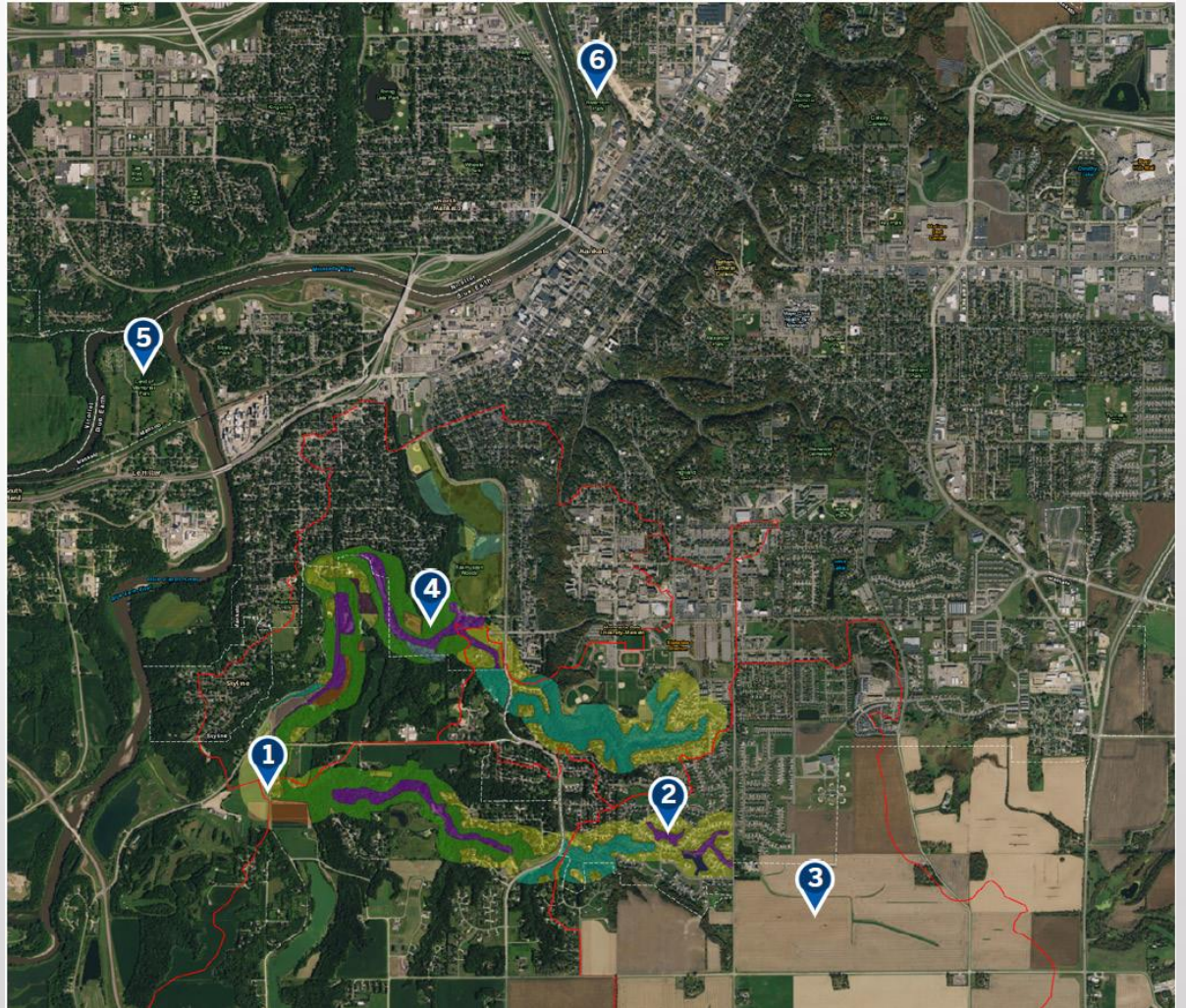
- Invested in Water Resource Recovery Facility — discharges at 75% below permitted phosphorous
- Platinum certification in Biosolids Management Program (highest level)
- 37% reduction in pollution sources since 2007
- 200 construction sites inspected/monitored annually
- Significant reductions in nitrogen, phosphorous and suspended solids to the Minnesota River since 2002
- Commitment to water recycling and reclamation saves 661 million gallons of water annually



# Stormwater Quality – What can we do?

## Stop Erosion, Control Flooding & Improve Regional Water Quality

- Number 1: Existing bridge at Indian Lake Road has reduced hydraulic capacity due to sediment accumulation.
- Number 2: Stream bank erosion due to scour on Indian Creek near South Brook Circle.
- Number 3: Wetland restoration. **Total estimated cost of all wetland projects: \$10 million.** Achievable load reduction for a wetland restoration in this area of Indian Creek Watershed: 9% total phosphorous reduction, 17% total suspended solids reduction. Total achievable load reduction for all three wetland restorations considered: 18% total phosphorous reduction, 33% total suspended solids reduction
- Number 4: In-channel improvements, prioritized by reach quality.
- Number 5: Land of Memories Park riverbank stabilization.
- Number 6: Bank of the Minnesota River along Riverfront Park.





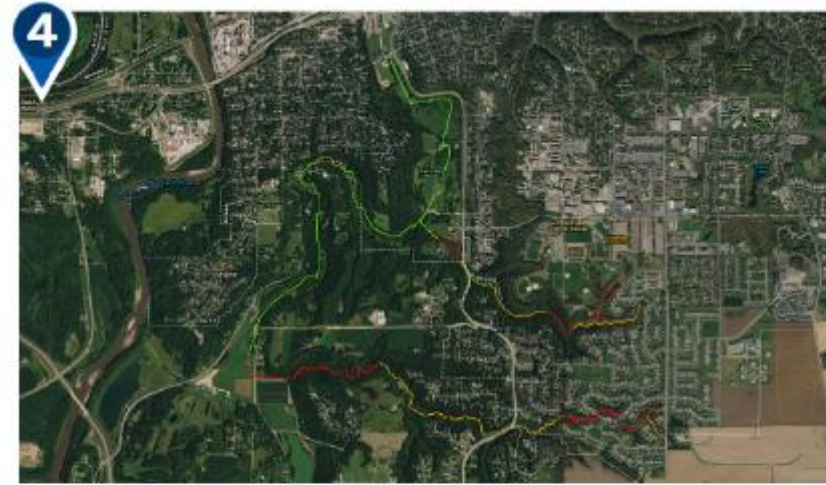


**Number 1:** Existing bridge at Indian Lake Road has reduced hydraulic capacity due to sediment accumulation.

*Estimated cost of bridge replacement: \$750,000*



**Number 2:** Stream bank erosion due to scour on Indian Creek near South Brook Circle.



— Good  
— Average  
— Poor

**Number 4:** In-channel improvements, prioritized by reach quality.

*Estimated cost: \$1 million*

**Number 5:** Land of Memories Park riverbank stabilization.

Left: A view of the city's water supply well from the bank of the Minnesota River.

Right: Bank erosion along the river, with bank receding toward city's water supply well. The bank has shifted approximately 30 feet toward the well since 2011.



**Number 6:** Bank of the Minnesota River along Riverfront Park.

*Total estimated cost of riverbank stabilization projects at Land of Memories Park and Riverfront Park: \$2 million.*



**Number 3:** Wetland restoration. *Total estimated cost of all wetland projects: \$10 million*

- Achievable load reduction for a wetland restoration in this area of Indian Creek Watershed: 9% total phosphorous reduction, 17% total suspended solids reduction
- Total achievable load reduction for all three wetland restorations considered: 18% total phosphorous reduction, 33% total suspended solids reduction

**State Partnership = Better Water Quality**  
*With state support & continued partnerships, we can further improve water quality.*

- Additional 18-25% reduction in phosphorus from rural runoff
- Additional 30% reduction in suspended solids from rural runoff
- Reduce uncontrolled peak flows from rural areas that impact system effectiveness by 50%
- Restore 210 acre-feet of rural retention capacity currently lost to wetlands impacts
- Reduce sediment & nutrient loads and address erosion to protect Land of Memories Park, Riverfront Park and the well field for drinking water
- Cost savings for MS4 Partners



# Continued Stewardship

- [Strategic Plan](#) highlights stewardship of environmental capital
- Anticipates Initiatives that:
  - Ensure a safe and healthy environment for residents, visitors and employees by restoring and protecting land, water, air and other natural resources
  - Sustain resources by reducing consumption, minimizing waste and using less energy through education, reduction, reuse and recycling
  - Promote and protect the Minnesota River watershed
  - Coordinate with partners on infrastructure improvement
  - Identify stakeholders in the Minnesota River watershed
- 2019 Proposed Budget includes:
  - Environmental Specialist with primary duties related to water and wastewater treatment and meeting regulatory requirements and solid waste/recycling. Providing additional capacity to focus on broader environmental stewardship initiatives listed above.

### Environmental capital

#### CHALLENGES

- ◆ Pursuing programs to divert more tonnage to sustainable practices, such as recycling and composting, to reduce volume of solid waste being landfilled.
- ◆ Availability of financial resources from federal and state sources to fund capital improvements needed to meet identified challenges, provide adequate potable water, protect Minnesota River water quality and provide solid waste reduction are not anticipated to grow and may decline, leaving a higher burden on consumers.
- ◆ Maintaining a level of overall community cleanliness for various city and other government owned rights of way, private property, ponds and other public spaces and medians.

#### STRATEGIES

- ◆ Create a structure to evaluate environmentally sustainable practices and develop long-range strategies to financially support them.
- ◆ Develop programs to promote environmentally sustainable practices that encourage broad community participation.
- ◆ Be a leader in addressing water quality of the Minnesota River.

#### INITIATIVES

**Ensure a safe and healthy environment for residents, visitors and employees by restoring and protecting land, water, air and other natural resources.** Develop and maintain adaptable services, policies and regulatory frameworks that protect natural resources.

**Sustain resources. Reduce consumption, minimize waste and use less energy through education, reduction, reuse and recycling.** Promote and expand recycling and reuse throughout the organization and community by providing educational opportunities, more recycling/reuse options and incentives.

**Promote and protect the Minnesota River watershed.** Develop programs to coordinate water quality efforts and promote Minnesota River watershed's importance to the region and state.

### Building and leveraging partnerships

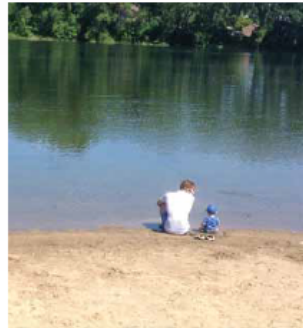
#### STRATEGIES

- ◆ Identify existing partnerships and actively engage them in exploring more ways to collaborate.

#### INITIATIVES

**Coordinate with partners on infrastructure improvement.** Identify and approach local and regional private and public stakeholders to review and coordinate upcoming projects.

**Identify stakeholders in the Minnesota River watershed.** Identify private and public entities and state and federal regulators within the watershed. Create a forum to identify common interests and goals with the intent of developing a comprehensive framework focused on water quality and promoting recreational use.



*First time at the pond by Paula Camacho, Markato*